

CLAIMS

I CLAIM AS MY INVENTION:

1. A thermal barrier coating material comprising a cubic matrix structure of
5 ZrO_2 stabilized by a concentration of Y_2O_3 greater than that concentration of Y_2O_3 that
would result in a peak ionic conductivity in the matrix.

2. The thermal barrier coating material of claim 1, further comprising at least
30 wt. % Y_2O_3 .

3. The thermal barrier coating material of claim 1, further comprising at least
40 wt. % Y_2O_3 .

4. The thermal barrier coating material of claim 1, further comprising at least
50 wt. % Y_2O_3 .

5. A thermal barrier coating material comprising a cubic matrix structure of
 ZrO_2 stabilized by a concentration of Y_2O_3 , wherein the concentration of Y_2O_3 is
sufficiently high to create a quantity of multi-vacancy defect clusters in the cubic matrix
20 structure such that the material exhibits a resistance to sintering measured as linear
shrinkage to be less than 4000 ppm after exposure to 1400 °C. for 24 hours.

6. A thermal barrier coating material comprising a cubic matrix structure of a
rare earth oxide selected from the group of zirconia, hafnia and titania and containing a
25 stabilizer selected from the group of lanthia, ytterbia and yttria, the material comprising a
concentration of the stabilizer greater than that concentration of the stabilizer that would
result in a peak ionic conductivity in the matrix.

7. The thermal barrier coating material of claim 6, further comprising at least
30 wt. % stabilizer.

8. The thermal barrier coating material of claim 6, further comprising at least 40 wt. % stabilizer.

9. The thermal barrier coating material of claim 6, further comprising at least 5 50 wt. % stabilizer.

10. A thermal barrier coating material comprising a cubic matrix structure of HfO₂ stabilized by a concentration of a rare earth oxide that is greater than that concentration of the rare earth oxide that would result in a peak ionic conductivity in the matrix.

11. The thermal barrier coating of claim 10, wherein the rare earth oxide comprises Gd₂O₃.

12. The thermal barrier coating material of claim 11, further comprising at least 30 wt. % Gd₂O₃.

13. The thermal barrier coating material of claim 11, further comprising at least 40 wt. % Gd₂O₃.

20 14. The thermal barrier coating material of claim 11, further comprising at least 50 wt. % Gd₂O₃.

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